

What Is Claimed Is:

1. An optical disc recording method, comprising:
repeatedly performing a test record a plurality
of times, prior to an actual record on an optical disc,
in an outer peripheral test area of the optical disc
which is on an outer peripheral side with respect to
a program area of the optical disc, wherein the test
record includes:

controlling a velocity to a predetermined
linear velocity, and

sequentially changing a recording power;
obtaining an appropriate recording power value
at the linear velocity, on the basis of reproduced
signals of the plural test records in the outer
peripheral test area; and

performing an actual record on the optical disc
while controlling the recording power to the
appropriate recording power value at the predetermined
linear velocity, or to an appropriate recording power
value which is obtained on the basis of the appropriate
recording power value at another linear velocity.

2. The optical disc recording method of claim 1,
further comprising:

on the basis of reproduced signals of the plural
test records in the outer peripheral test area,
obtaining a recording power value for each of the test

6 records, wherein a predetermined parameter relating
7 to a reproduced signal quality has an appropriate value
8 at the recording power value; and

9 on the basis of recording power values which
10 are obtained respectively for the test records,
11 obtaining the appropriate recording power value at
12 the predetermined linear velocity.

1 3. The optical disc recording method of claim 2,
2 further comprising:

3 eliminating an outlier value in the recording
4 power values respectively obtained for the plural test
5 records in the outer peripheral test area;

6 obtaining an average value of remaining recording
7 power values; and

8 obtaining the average value as the appropriate
9 recording power value at the predetermined linear
10 velocity.

1 4. The optical disc recording method of claim 2,
2 further comprising:

3 obtaining a minimum value of the recording power
4 values respectively obtained for the plural test
5 records in the outer peripheral test area; and

6 obtaining the minimum value as the appropriate
7 recording power value at the predetermined linear
8 velocity.

11/11/68

1 5. The optical disc recording method of claim 1,
2 wherein the plural test records in the outer peripheral
3 test area are respectively performed in areas which
4 are sequentially shifted in a circumferential direction
5 of the optical disc.

1 6. The optical disc recording method of claim 2,
2 wherein the plural test records in the outer peripheral
3 test area are respectively performed in areas which
4 are sequentially shifted in a circumferential direction
5 of the optical disc.

1 7. The optical disc recording method of claim 3,
2 wherein the plural test records in the outer peripheral
3 test area are respectively performed in areas which
4 are sequentially shifted in a circumferential direction
5 of the optical disc.

1 8. The optical disc recording method of claim 4,
2 wherein the plural test records in the outer peripheral
3 test area are respectively performed in areas which
4 are sequentially shifted in a circumferential direction
5 of the optical disc.

1 9. The optical disc recording method of claim 1,
2 wherein the outer peripheral test area is set in a

3 remaining area which is obtained by removing an area
4 corresponding to a predetermined lead-out area from
5 a portion which is on an outer peripheral side of an
6 information area with starting from a maximum allowable
7 outer peripheral position of the program area.

1 10. The optical disc recording method of claim 2,
2 wherein the outer peripheral test area is set in a
3 remaining area which is obtained by removing an area
4 corresponding to a predetermined lead-out area from
5 a portion which is on an outer peripheral side of an
6 information area with starting from a maximum allowable
7 outer peripheral position of the program area.

1 11. The optical disc recording method of claim 3,
2 wherein the outer peripheral test area is set in a
3 remaining area which is obtained by removing an area
4 corresponding to a predetermined lead-out area from
5 a portion which is on an outer peripheral side of an
6 information area with starting from a maximum allowable
7 outer peripheral position of the program area.

1 12. The optical disc recording method of claim 4,
2 wherein the outer peripheral test area is set in a
3 remaining area which is obtained by removing an area
4 corresponding to a predetermined lead-out area from
5 a portion which is on an outer peripheral side of an

6 information area with starting from a maximum allowable
7 outer peripheral position of the program area.

1 13. The optical disc recording method of claim 5,
2 wherein the outer peripheral test area is set in a
3 remaining area which is obtained by removing an area
4 corresponding to a predetermined lead-out area from
5 a portion which is on an outer peripheral side of an
6 information area with starting from a maximum allowable
7 outer peripheral position of the program area.

1 14. An optical disc recording method in which an
2 actual record is performed on an optical disc while,
3 in an inner peripheral side of the optical disc with
4 respect to an adequate radial position, a velocity
5 is controlled by making a rotational velocity constant,
6 and, in an outer peripheral side of the optical disc,
7 the velocity is controlled by making a linear velocity
8 constant at a final value of a linear velocity in the
9 constant rotational velocity control, said method
10 comprising:

11 performing a test record one time, prior to the
12 actual record on the optical disc, in an inner peripheral
13 test area of the optical disc which is on an inner
14 peripheral side with respect to a program area of the
15 optical disc, while controlling a velocity by making
16 a linear velocity constant at an initial value of the

17 linear velocity in the constant rotational velocity
18 control record and sequentially changing a recording
19 power;

20 repeatedly performing the test record a plurality
21 of times, in an outer peripheral test area which is
22 on an outer peripheral side with respect to the program
23 area of the optical disc, while controlling the velocity
24 by making a linear velocity constant at a final value
25 of a linear velocity in the constant rotational velocity
26 control record and sequentially changing a recording
27 power;

28 on the basis of a reproduced signal of the one
29 test record in the inner peripheral test area, obtaining
30 a recording power value at which a predetermined
31 parameter relating to a reproduced signal quality has
32 an appropriate value, so that the obtained value is
33 set as a recording power value at the initial value
34 of the linear velocity in the constant rotational
35 velocity control record;

36 on the basis of reproduced signals of the plural
37 test records in the outer peripheral test area,
38 obtaining a recording power value at which the parameter
39 has an appropriate value for each of the test records,
40 and obtaining an appropriate recording power value
41 on the basis of recording power values which are obtained
42 respectively for the test records, so that the obtained
43 value is set as a recording power value at the final

44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62

1
2
3
4
5
6
7

value of the linear velocity in the constant rotational velocity control record and in the constant linear velocity control record;

in the area where the constant rotational velocity control record is performed when an actual record is performed on the optical disc, in accordance with the linear velocity at each position, interpolating the value which has been set as the recording power value at the initial value of the linear velocity and the value which has been set as the recording power value at the final value of the linear velocity, and controlling the recording power value to the interpolated value; and

in the area where the constant linear control record is performed when the actual record is performed on the optical disc, controlling the recording power value to the value which has been set as the recording power value in the constant linear velocity control record.

15. The optical disc recording method of claim 14, further comprising:

eliminating an outlier value in the recording power values respectively obtained for the plural test records in the outer peripheral test area;

obtaining an average value of remaining recording power values; and

8 setting the average value as the recording power
9 value at the final value of the linear velocity in
10 the constant rotational velocity control record, and
11 in the constant linear velocity control record.

1 16. The optical disc recording method of claim 14,
2 further comprising:

3 obtaining a minimum value of the recording power
4 values respectively obtained for the plural test
5 records in the outer peripheral test area; and

6 setting the minimum value as the recording power
7 value at the final value of the linear velocity in
8 the constant rotational velocity control record, and
9 in the constant linear velocity control record.

1 17. The optical disc recording method of claim 14,
2 wherein the plural test records in the outer peripheral
3 test area are respectively performed in areas which
4 are sequentially shifted in a circumferential direction
5 of the optical disc.

1 18. The optical disc recording method of claim 15,
2 wherein the plural test records in the outer peripheral
3 test area are respectively performed in areas which
4 are sequentially shifted in a circumferential direction
5 of the optical disc.

1 19. The optical disc recording method of claim 16,
2 wherein the plural test records in the outer peripheral
3 test area are respectively performed in areas which
4 are sequentially shifted in a circumferential direction
5 of the optical disc.

1 20. The optical disc recording method of claim 14,
2 wherein the outer peripheral test area is set in a
3 remaining area which is obtained by removing an area
4 corresponding to a predetermined lead-out area from
5 a portion which is on an outer peripheral side of an
6 information area with starting from a maximum allowable
7 outer peripheral position of the program area.

1 21. The optical disc recording method of claim 15,
2 wherein the outer peripheral test area is set in a
3 remaining area which is obtained by removing an area
4 corresponding to a predetermined lead-out area from
5 a portion which is on an outer peripheral side of an
6 information area with starting from a maximum allowable
7 outer peripheral position of the program area.

1 22. The optical disc recording method of claim 16,
2 wherein the outer peripheral test area is set in a
3 remaining area which is obtained by removing an area
4 corresponding to a predetermined lead-out area from
5 a portion which is on an outer peripheral side of an

6 information area with starting from a maximum allowable
7 outer peripheral position of the program area.

1 23. The optical disc recording method of claim 17,
2 wherein the outer peripheral test area is set in a
3 remaining area which is obtained by removing an area
4 corresponding to a predetermined lead-out area from
5 a portion which is on an outer peripheral side of an
6 information area with starting from a maximum allowable
7 outer peripheral position of the program area.

1 24. An optical disc recording device in which an
2 actual record is performed on an optical disc while,
3 in an inner peripheral side of the optical disc with
4 respect to an adequate radial position, a velocity
5 is controlled by making a rotational velocity constant,
6 and, in an outer peripheral side of the optical disc,
7 the velocity is controlled by making a linear velocity
8 constant at a final value of a linear velocity in the
9 constant rotational velocity control, said device
10 comprising:

11 a disc servo circuit which rotates the optical
12 disc;

13 an optical pickup which irradiates the optical
14 disc with a light beam to perform record and reproduction
15 operations on the optical disc;

16 an optical power controlling section which

Patented May 11, 1960

17 controls a power of the light beam emitted from the
18 optical pickup;

19 a signal quality detecting section which obtains
20 a predetermined parameter relating to a reproduced
21 signal quality on the basis of a reproduced signal
22 detected by the optical pickup; and

23 a system controlling section, wherein, in the
24 system controlling section,

25 prior to the actual record on the optical disc,
26 in an inner peripheral test area which is on an inner
27 peripheral side with respect to a program area of the
28 optical disc, a test record is performed one time while
29 a velocity is controlled by making a linear velocity
30 constant at an initial value of the linear velocity
31 in the constant rotational velocity control record
32 and a recording power is sequentially changed, and,
33 in an outer peripheral test area which is on an outer
34 peripheral side with respect to the program area of
35 the optical disc, the test record is repeatedly
36 performed a plurality of times while the velocity is
37 controlled by making a linear velocity constant at
38 a final value of a linear velocity in the constant
39 rotational velocity control record,

40 on the basis of a reproduced signal of the one
41 test record in the inner peripheral test area, a
42 recording power value at which a predetermined
43 parameter relating to a reproduced signal quality has

44 an appropriate value is obtained, and the obtained
45 value is set as a recording power value at the initial
46 value of the linear velocity in the constant rotational
47 velocity control record,

48 on the basis of reproduced signals of the plural
49 test records in the outer peripheral test area, a
50 recording power value at which the parameter has an
51 appropriate value is obtained for each of the test
52 records, and an appropriate recording power value is
53 obtained on the basis of recording power values which
54 are obtained respectively for the test records, and
55 the obtained value is set as a recording power value
56 at the final value of the linear velocity in the constant
57 rotational velocity control record, and in the constant
58 linear velocity control record, and

59 in an actual record on the optical disc, in the
60 area where the constant rotational velocity control
61 record is performed, the record is performed while,
62 in accordance with the linear velocity at each position,
63 interpolating the value which has been set as the
64 recording power value at the initial value of the linear
65 velocity, and the value which has been set as the
66 recording power value at the final value of the linear
67 velocity, and controlling the recording power value
68 to the interpolated value, and, in the area where the
69 constant linear control record is performed, the record
70 is performed while controlling the recording power

71 value to the value which has been set as the recording
72 power value in the constant linear velocity control
73 record.

1 25. The optical disc recording device of claim 24,
2 wherein the system controlling section eliminates an
3 outlier value of the recording power values
4 respectively obtained for the plural test records in
5 the outer peripheral test area, obtains an average
6 value of remaining recording power values, and sets
7 the average value as the recording power value at the
8 final value of the linear velocity in the constant
9 rotational velocity control record, and in the constant
10 linear velocity control record.

1 26. The optical disc recording device of claim 24,
2 wherein the system controlling section obtains a
3 minimum value of the recording power values
4 respectively obtained in the plural test records in
5 the outer peripheral test area, and sets the minimum
6 value as the recording power value at the final value
7 of the linear velocity in the constant rotational
8 velocity control record, and in the constant linear
9 velocity control record.

1 27. The optical disc recording device of claim 24,
2 wherein the system controlling section respectively

3 performs the plural test records in the outer peripheral
4 test area in areas which are sequentially shifted in
5 a circumferential direction of the optical disc.

1 28. The optical disc recording device of claim 25,
2 wherein the system controlling section respectively
3 performs the plural test records in the outer peripheral
4 test area in areas which are sequentially shifted in
5 a circumferential direction of the optical disc.

1 29. The optical disc recording device of claim 26,
2 wherein the system controlling section respectively
3 performs the plural test records in the outer peripheral
4 test area in areas which are sequentially shifted in
5 a circumferential direction of the optical disc.

1 30. The optical disc recording device of claim 24,
2 wherein the system controlling section sets the outer
3 peripheral test area in a remaining area which is
4 obtained by removing an area corresponding to a
5 predetermined lead-out area from a portion which is
6 on an outer peripheral side of an information area
7 with starting from a maximum allowable outer peripheral
8 position of the program area.

1 31. The optical disc recording device of claim 25,
2 wherein the system controlling section sets the outer

3 peripheral test area in a remaining area which is
4 obtained by removing an area corresponding to a
5 predetermined lead-out area from a portion which is
6 on an outer peripheral side of an information area
7 with starting from a maximum allowable outer peripheral
8 position of the program area.

1 32. The optical disc recording device of claim 26,
2 wherein the system controlling section sets the outer
3 peripheral test area in a remaining area which is
4 obtained by removing an area corresponding to a
5 predetermined lead-out area from a portion which is
6 on an outer peripheral side of an information area
7 with starting from a maximum allowable outer peripheral
8 position of the program area.

1 33. The optical disc recording device of claim 27,
2 wherein the system controlling section sets the outer
3 peripheral test area in a remaining area which is
4 obtained by removing an area corresponding to a
5 predetermined lead-out area from a portion which is
6 on an outer peripheral side of an information area
7 with starting from a maximum allowable outer peripheral
8 position of the program area.

1 34. An optical disc, comprising:
2 an inner peripheral test area which is formed

3 in a portion on an inner peripheral side of the optical
4 disc with respect to a program area; and
5 an outer peripheral test area which is wider
6 than the inner peripheral test area, and is formed
7 in a portion on an outer peripheral side of the optical
8 disc with respect to the program area.

[Handwritten signature]